City of Alexandria, Virginia

Long-Term Control Plan Update

Progress Report

VDEQ
January 29, 2015

City of Alexandria, Virginia

AGENDA

- Technical Memoranda Status Update
- Public Participation Process
- Typical Year Selection
- CSO Technology Screening
- Alternatives for Detailed Evaluation
- Next Steps

Technical Memoranda Status

Tech Memo	Status – Provide to DEQ
Work Plan	Complete – May 2014
CSS Characterization	Complete – September 2014
Flow Projections	Complete – September 2014
Typical Year Selection	Complete – September 2014
Regulatory Requirements	Complete – October 2014
Public Participation Plan	Complete – October 2014
CSS Sewershed Changes	Complete – January 2015
H&H Modeling Plan	Complete – January 2015
CSO Technologies Screening	Complete – January 2015
Evaluation Criteria	Draft Status
Basis for Cost Estimating	Draft Status
Detailed Alternatives Evaluation	In Progress
Water Quality Modeling	In Progress

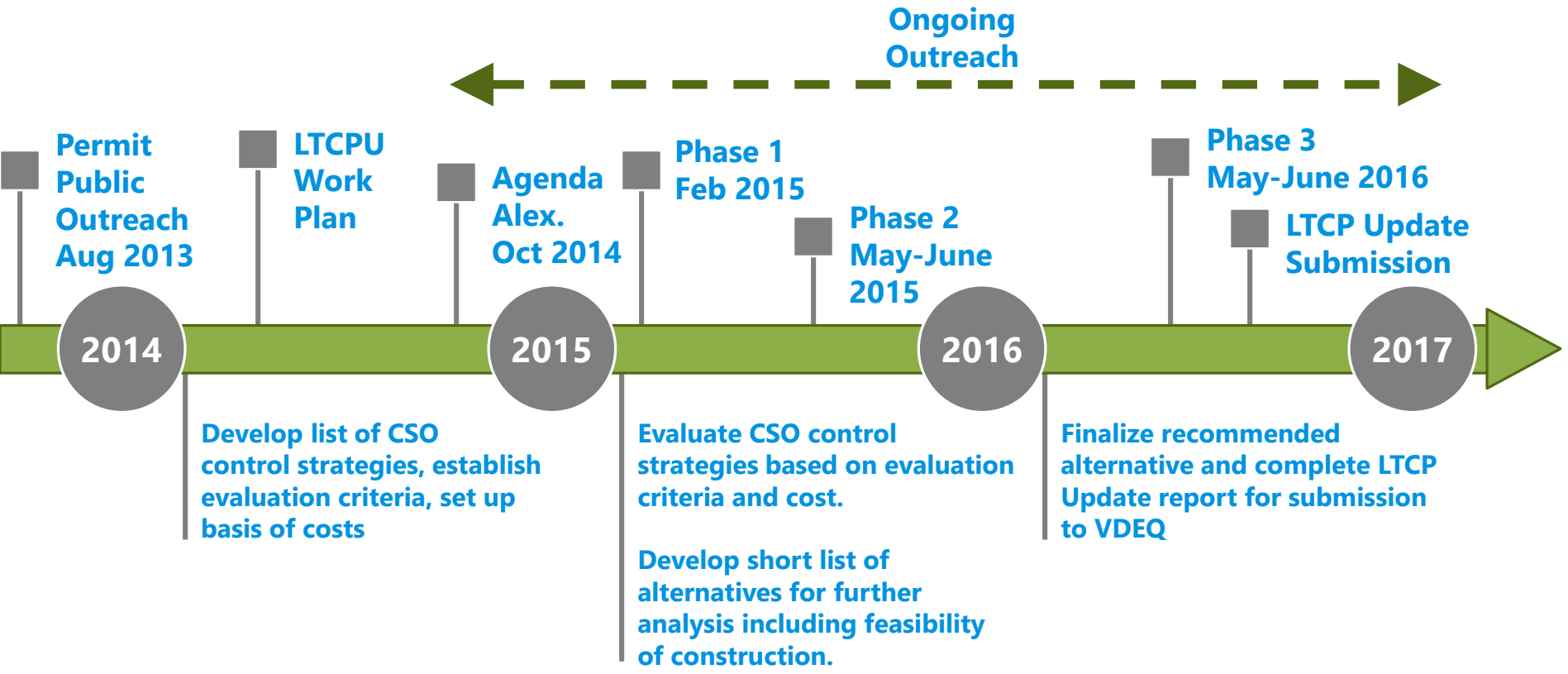
Public Participation Process – Educate – Inform – Be Responsive

* Public outreach to:
  - General Public
  - Environmental Policy Commission
  - Federation of Civic Associations
  - Old Town Civic Association
  - West Old Town Citizens Association
  - Porto Vecchio Condominium Association
  - Agenda Alexandria

Public Participation Plan

* Public participation for the LTCPU will occur in three phases and mirror those described in the *What's Next Alexandria* handbook
  - Phase 1 (Winter 2015)
    - AlexRenew Board Meeting on October 21, 2014
    - Agenda Alexandria meeting held October 27, 2014
    - Ongoing engagement with various Civic Associations and the EPC
    - **Public Meeting Scheduled for February 5, 7:00 pm – 9:00 pm**
  - Phase 2 (May-June 2015)
  - Phase 3 (May-June 2016)

Planning Timeline



Typical Year Selection

Table 4-1
Metric Weightings

Evaluation Criteria	Weight
Annual Rainfall	30%
Back-to-Back Events	5%
Number of Events Greater than 0.10 inches	12%
Number of Events Greater than 0.25 inches	13%
Average Rainfall Duration	15%
Average Rainfall Intensity	10%
Maximum Peak Intensity	5%
Maximum Storm Size	10%

Table 6-1
Top Five One-Year Time Periods

Rank	One-Year Time Period	Weighted Average
1	1984	9.78
2	1999	10.11
3	1995	10.18
4	1990	10.51
5	1978	10.62

* For the purposes of the LTCPU the year 1984 will be used as the typical year for hydrologic and hydraulic analysis and modeling.

CSO Control Technology Screening

* Primary Technologies
  - Separation
  - Conveyance
  - Outfall Consolidation/Relocation
  - Tunnel Storage
  - Tank Storage
  - Disinfection
  - Green Infrastructure
* Complementary Technologies
  - Roof Leader Disconnection
  - Sump Pump Disconnection
  - Regulator Modifications
  - Real Time Control
  - Low-Flow Fixtures

Table ES-1

Summary of Alternatives

No.	Description	Technologies
1.	Tunnels from CSO 003/004 and CSO 002 to AlexRenew	Storage, Outfall Consolidation, Regulator Modifications, and Real Time Control
2.	Tunnel to the Potomac River capturing CSO 002, 003, and 004.	Storage, Conveyance, Outfall Relocation, Regulator Modifications, and Real Time Control
3.	Storage at CSO 003/004 and CSO 002	Above Ground Storage, Below Ground Storage, and Regulator Modifications
4.	Disinfection	UV, Peracetic Acid, and Sodium Hypochlorite Disinfection
5.	Separation	Rain Leader Disconnection, Sump Pump Disconnection, Sewer Separation
6.	Green Infrastructure	Permeable Pavement, Planter Boxes, Bioswales, and Rain Gardens
7.	Tunnel from 003/004 to AlexRenew + Storage at 002	Storage, Outfall Consolidation, Regulator Modifications, and Real Time Control
8.	Tunnel form 003/004 to AlexRenew + Disinfection at 002	Storage, Outfall Consolidation, Regulator Modifications, Disinfection, and Real Time Control
9.	Tunnels from 003/004 and 002 + GI and Separation	Storage, Outfall Consolidation, Regulator Modifications, GI, and Separation, and Real Time Control
10.	Tunnel from 003/004 to AlexRenew + Storage at 002 + GI and Separation	Storage, Outfall Consolidation, Regulator Modifications, GI, and Separation, and Real Time Control

A and B Scenarios for Each Alternative

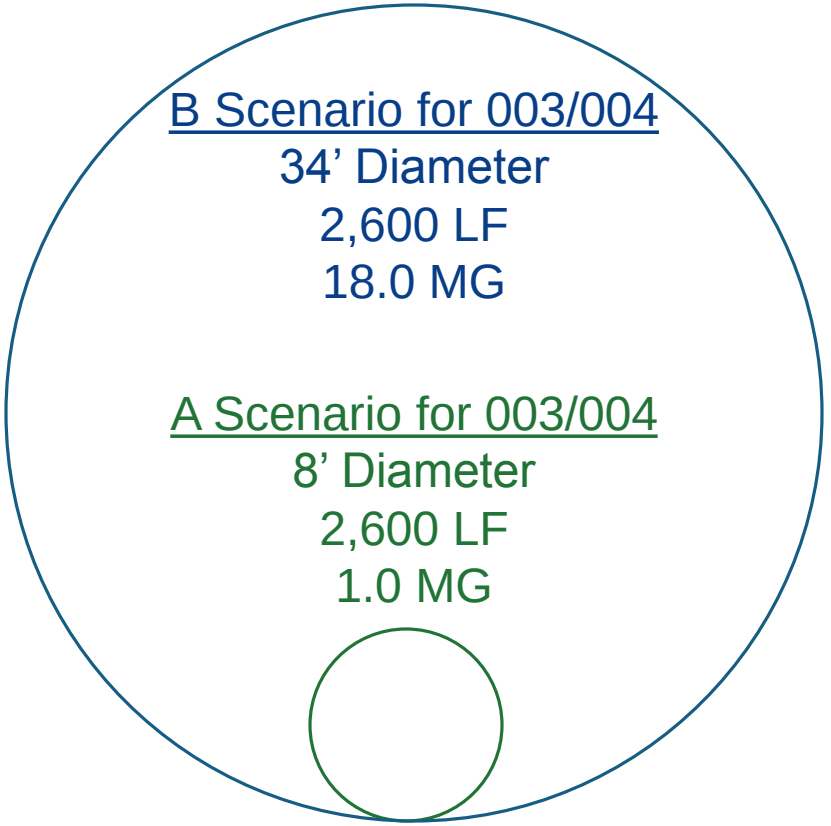
* Scenario A
  - Size infrastructure to capture/treat the CSO volume of the 5th largest storm in 1984, for CSO outfalls 002, 003 and 004.
  - Anticipate the Water Quality Modeling will support a reasonably sized project.
* Scenario B
  - Size infrastructure to capture/treat the CSO volume to achieve 80% (002) and 99% (003 and 004) bacteria reduction for the 2004-2005 TMDL period.

Alternatives 1 and 2 Tunnels

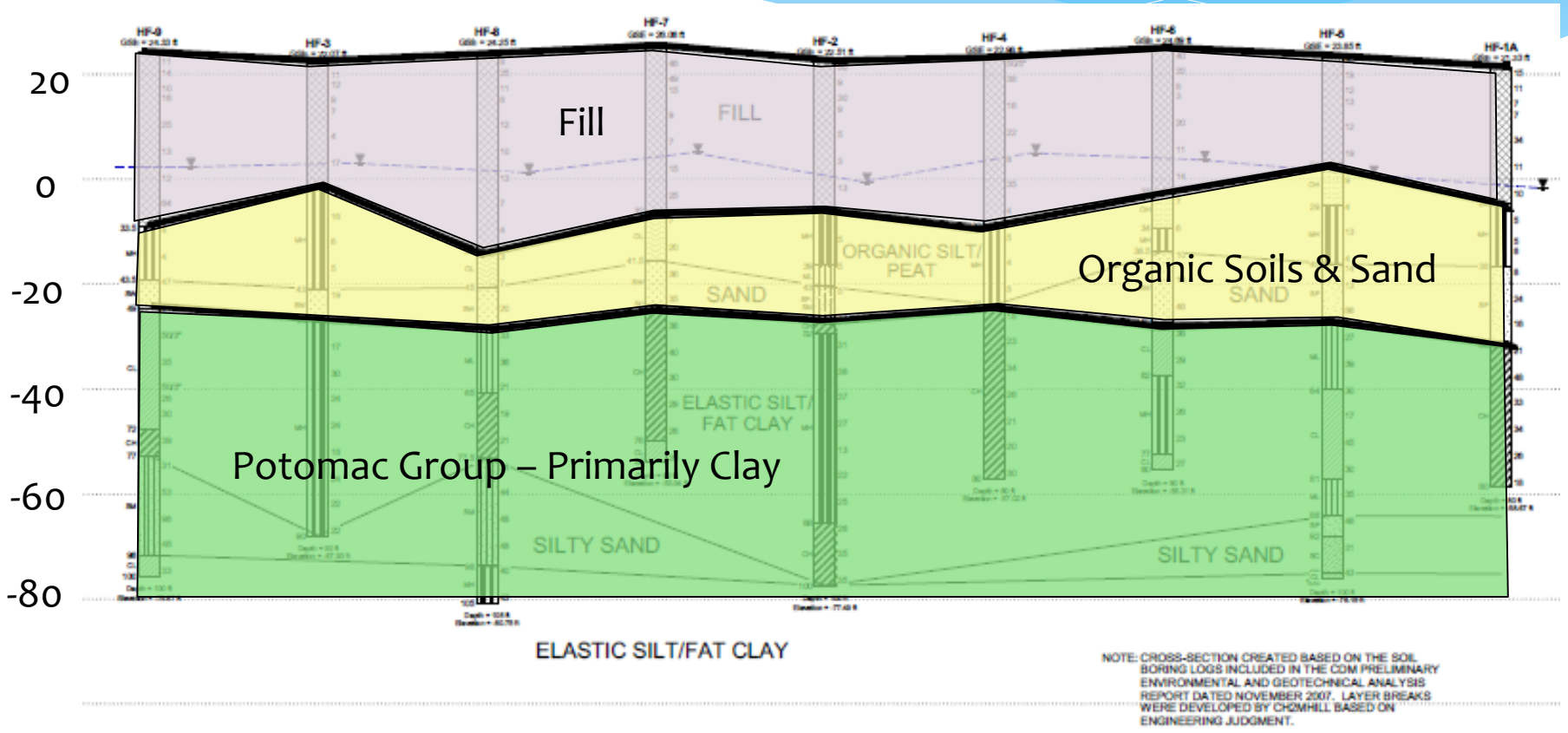
*Tunnel alignment shown for illustrative purposes only

Tunnel Sizing

1984 Overflow Ranking	CSO-004 (MG)	CSO-003 (MG)	CSO-002 (MG)
1	0.469	1.800	4.550
2	0.391	1.439	3.871
3	0.320	1.184	3.632
4	0.129	0.758	2.060
5	0.115	0.661	1.975
6	0.113	0.618	1.893
7	0.108	0.492	1.703
8	0.063	0.489	1.602
9	0.060	0.480	1.267
10	0.060	0.477	1.226

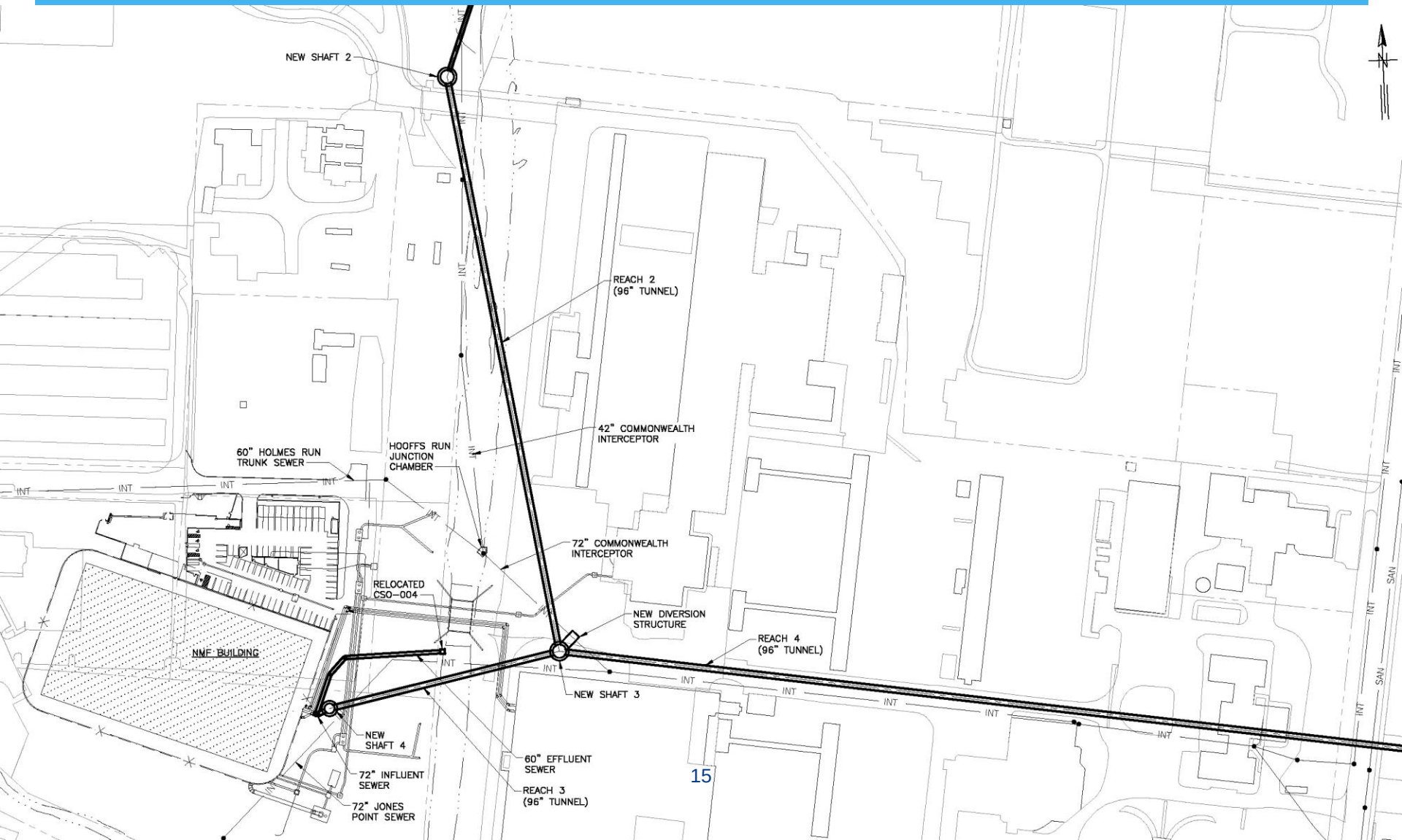


Local Geology



Generalized Subsurface Profile at NMF

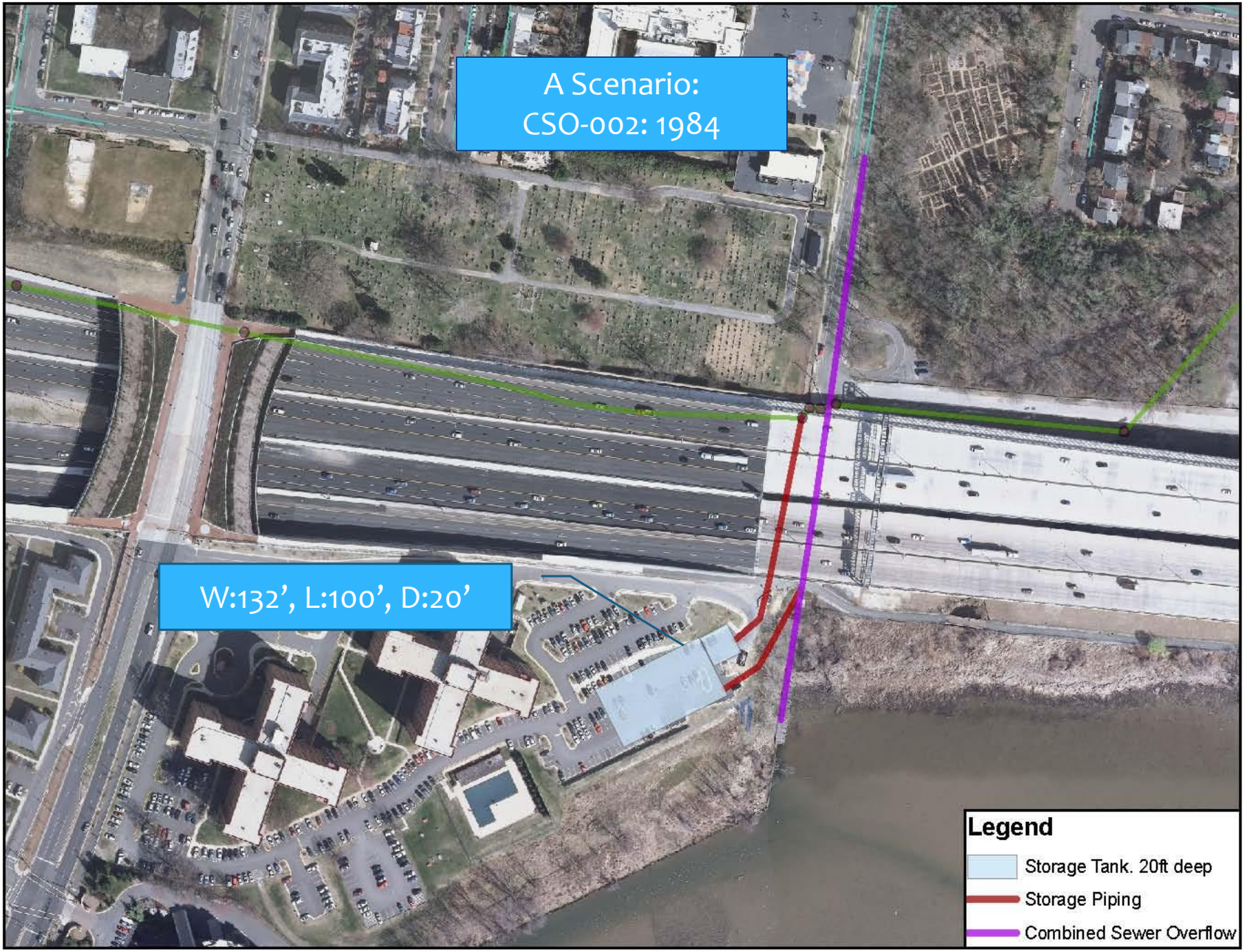
AlexRenew Site



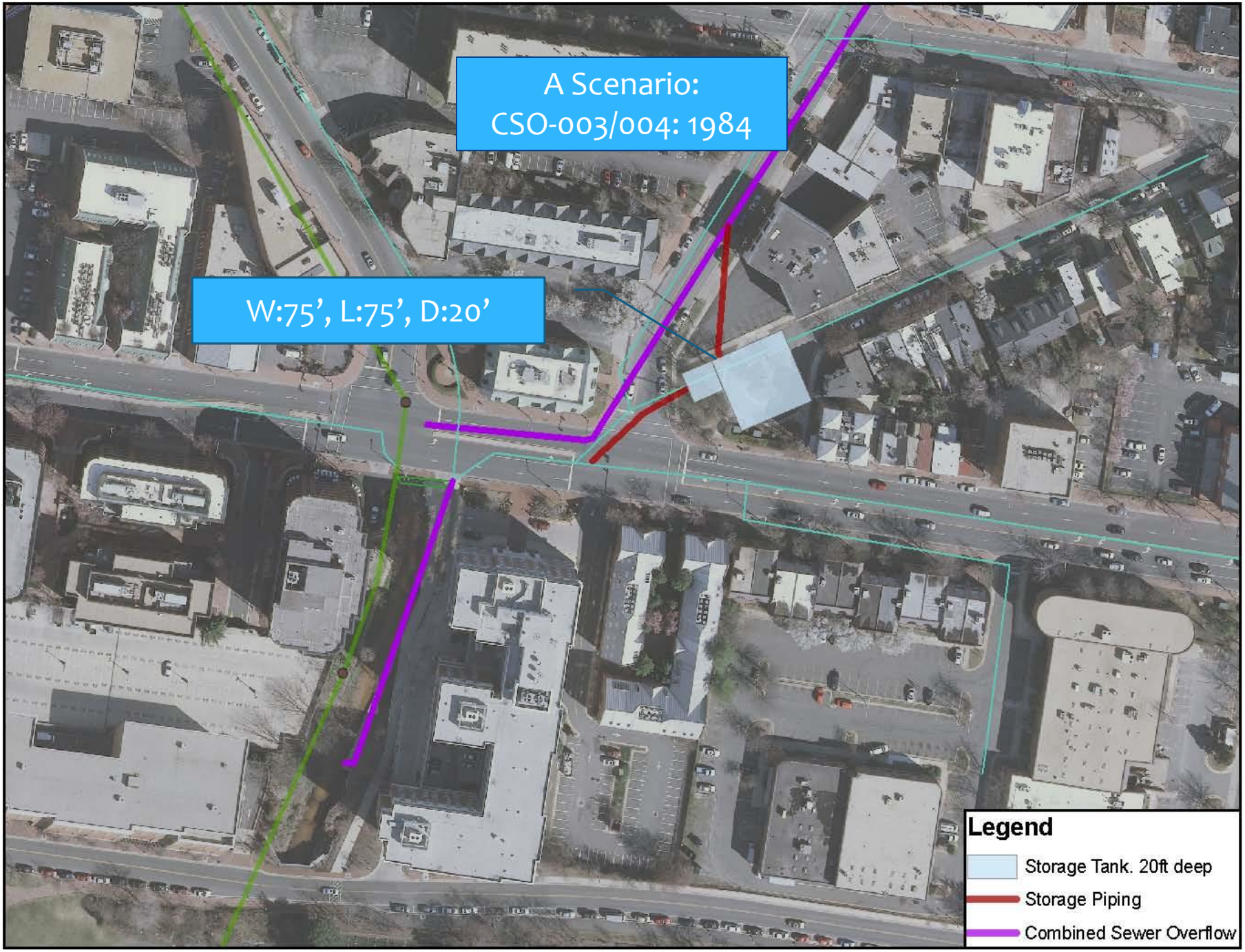
Alternative 3 Storage

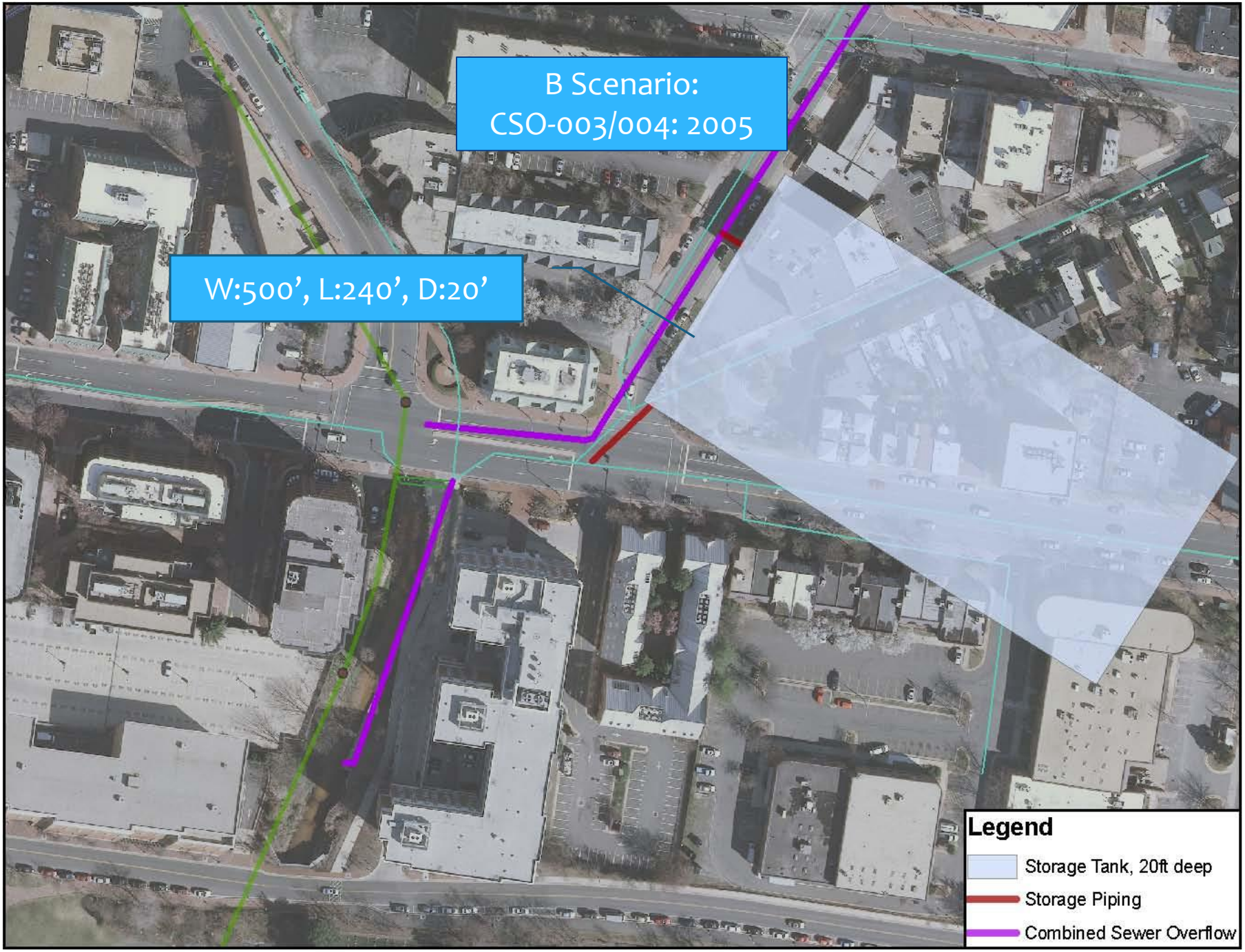
Sizing Summary

Disinfection Facility	Unit	CSO 002	CSO 003 & 004
Design Overflow Volume			
Scenario A: 1984 5th largest storm overflow	MG	2.0	0.8
Scenario B: 2004-2005 TMDL period	MG	25.0	18.0


A Scenario:
CSO-002: 1984
W:132', L:100', D:20'
Legend
Storage Tank. 20ft deep
Storage Piping
Combined Sewer Overflow


B Scenario:
CSO-002: 2005
W:850', L:250', D:20'
Legend
Storage Tank, 20ft deep
Storage Piping
Combined Sewer Overflow

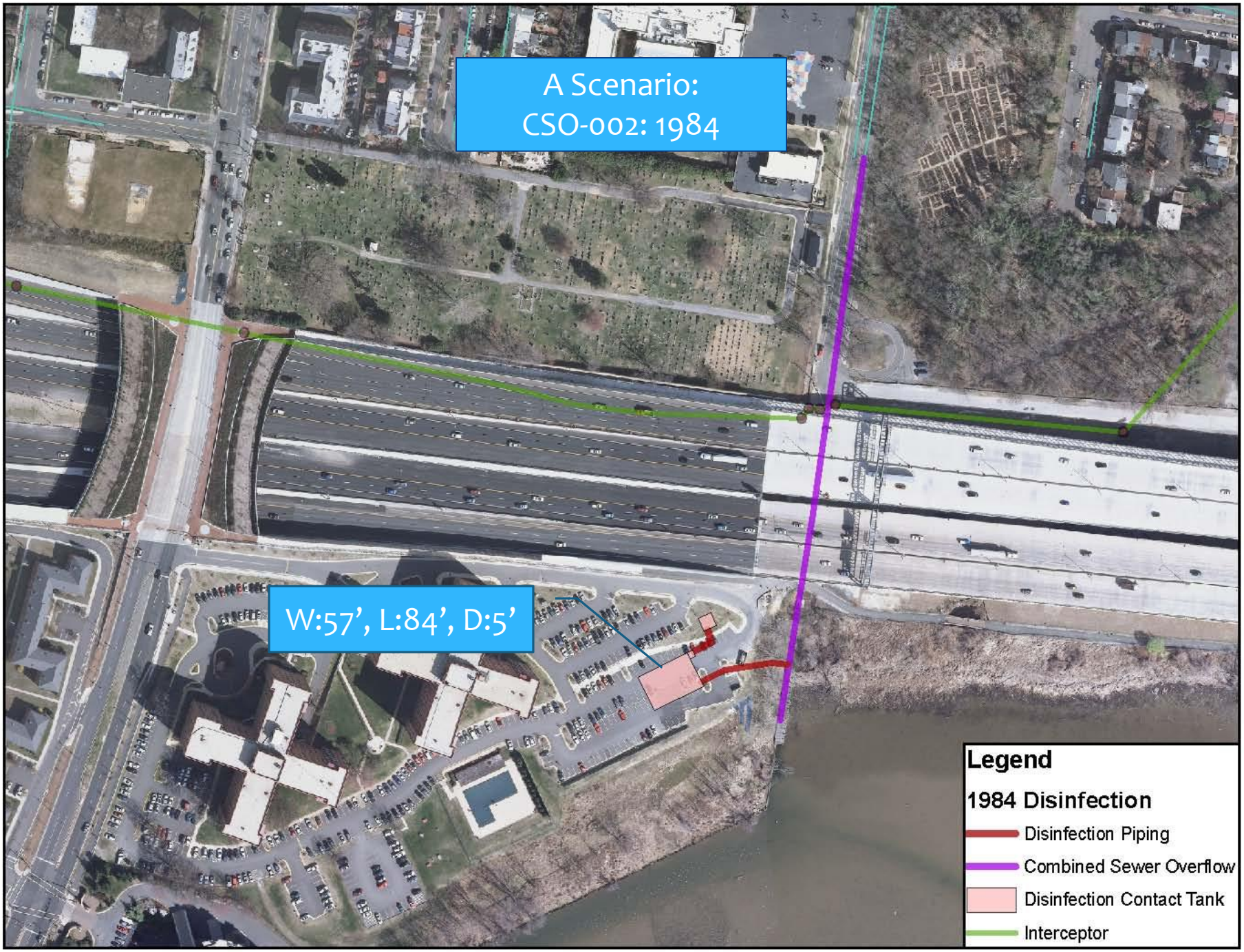

A Scenario:
CSO-003/004: 1984
W:75', L:75', D:20'
Legend
Storage Tank. 20ft deep
Storage Piping
Combined Sewer Overflow

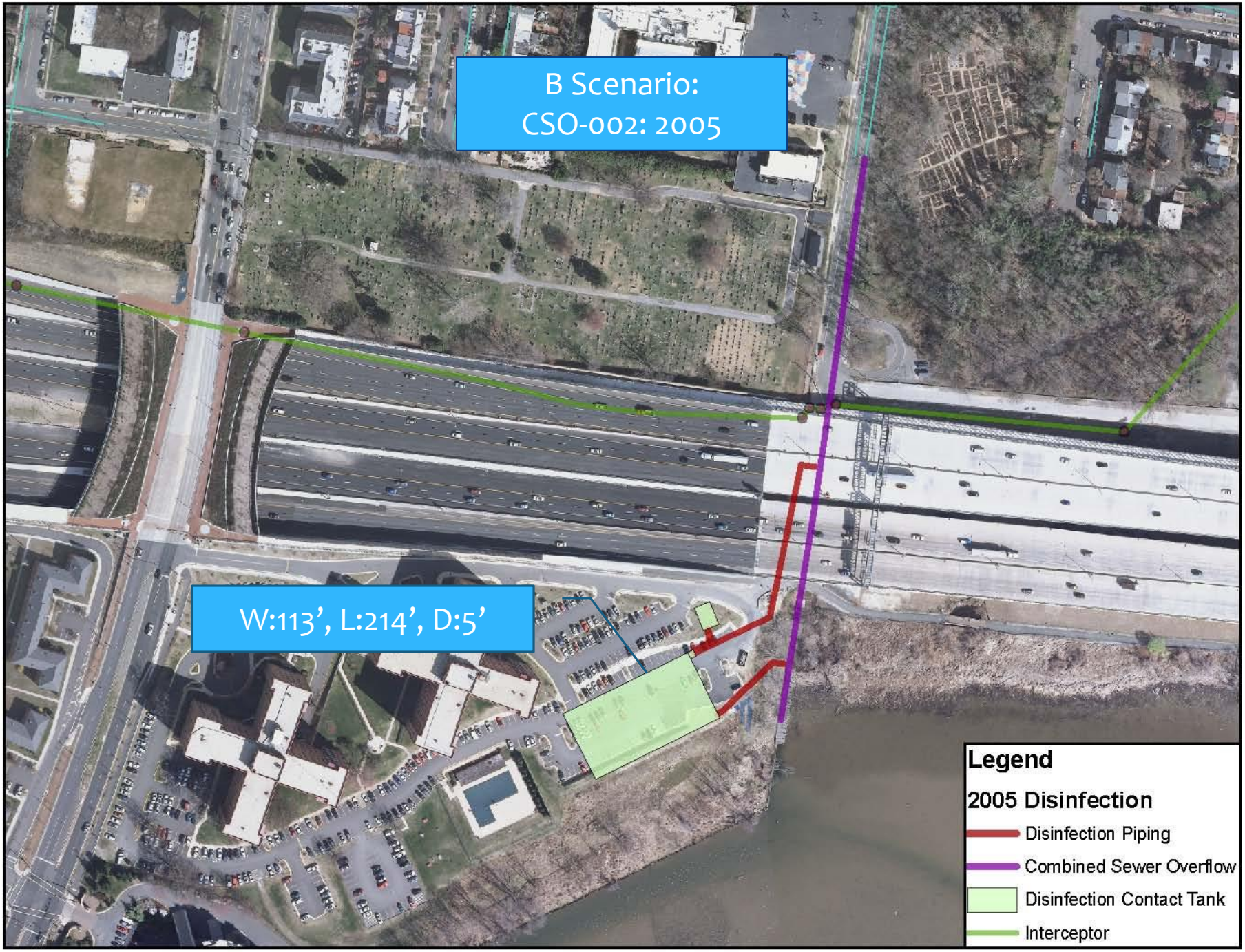

B Scenario:
CSO-003/004: 2005
W:500', L:240', D:20'
Legend
Storage Tank, 20ft deep
Storage Piping
Combined Sewer Overflow

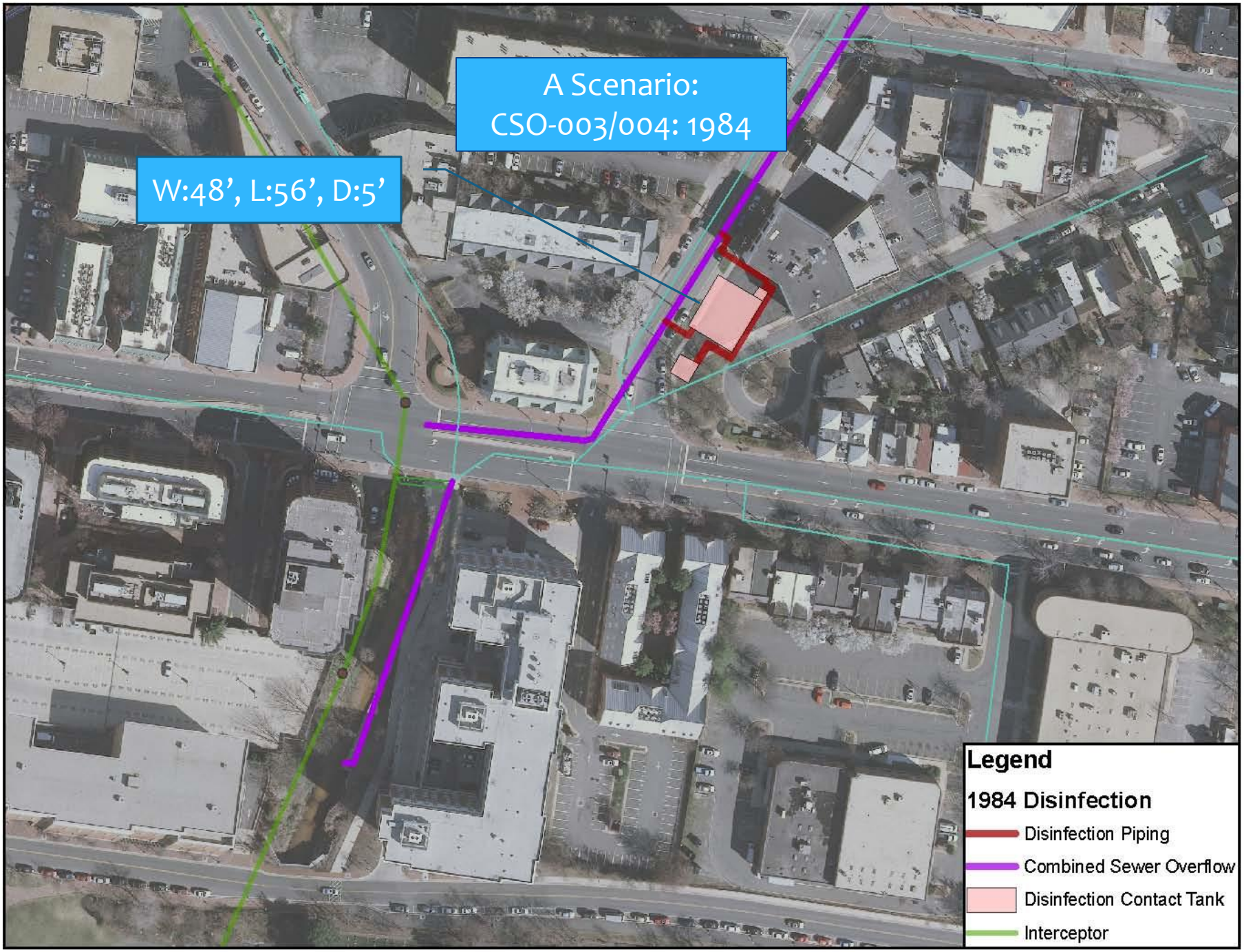
Alternative 4
Disinfection

Disinfection Sizing

Disinfection Facility	Unit	A Scenario		B Scenario	
		CSO 002	CSO 003 & 004	CSO 002	CSO 003 & 004
Design Overflow Volume and Flowrate					
Storm Overflow Volume	MG	1.97	0.78	31.65	17.81
Storm Flowrate	MGD	16.59	11.11	113.41	94.79
Target Disinfection					
Percentage bacterial reduction	%	99.0%	99.9%	80.0%	99.0%
Ct value	min-mg/L	24.9	52.0	9.5	24.9
Chlorine concentration, C	mg/L	20.0	20.0	20.0	20.0
Required contact time, t	min	1.2	2.6	0.5	1.2
Assumed contact time, t	min	10	10	10	10
Sodium Hypochlorite System					
Sodium Hypochlorite Solution Strength	%	5%	5%	5%	5%
Sodium Hypochlorite Storage Volume	cf	4,376	1,709	11,405	6,417
Sodium Hypochlorite Storage Tank Volume	cf	4,400	2,000	12,200	6,650
Sodium Hypochlorite Storage Area	sf	83	39	157.1	81.2
Days of Storage Average Volume	days	15	18	17	15
Days of Storage Peak Volume	days	6	7	1	1


A Scenario:
CSO-002: 1984
W:57', L:84', D:5'
Legend
1984 Disinfection
Disinfection Piping
Combined Sewer Overflow
Disinfection Contact Tank
Interceptor


B Scenario:
CSO-002: 2005
W:113', L:214', D:5'
Legend
2005 Disinfection
Disinfection Piping
Combined Sewer Overflow
Disinfection Contact Tank
Interceptor

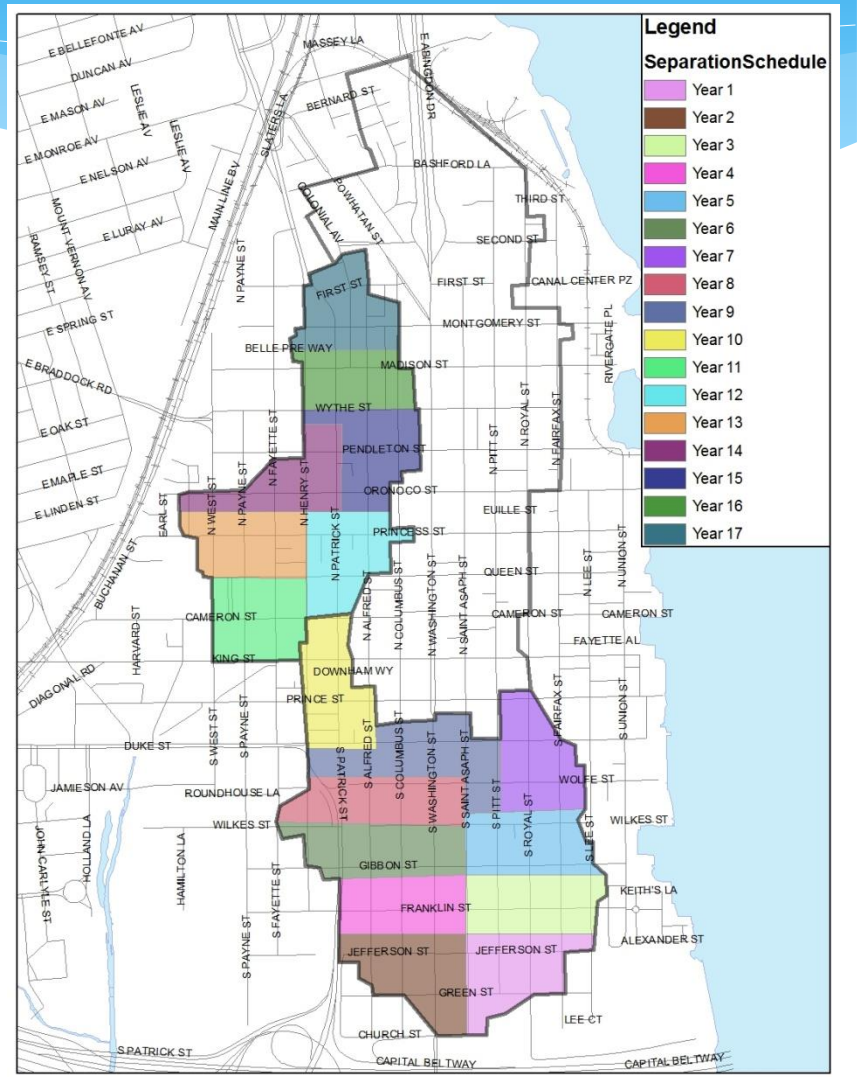

A Scenario:
CSO-003/004: 1984
W:48', L:56', D:5'
Legend
1984 Disinfection
Disinfection Piping
Combined Sewer Overflow
Disinfection Contact Tank
Interceptor


B Scenario:
CSO-003/004: 2005
W:157', L:164', D:5'
Legend
2005 Disinfection
Disinfection Piping
Combined Sewer Overflow
Disinfection Contact Tank
Interceptor

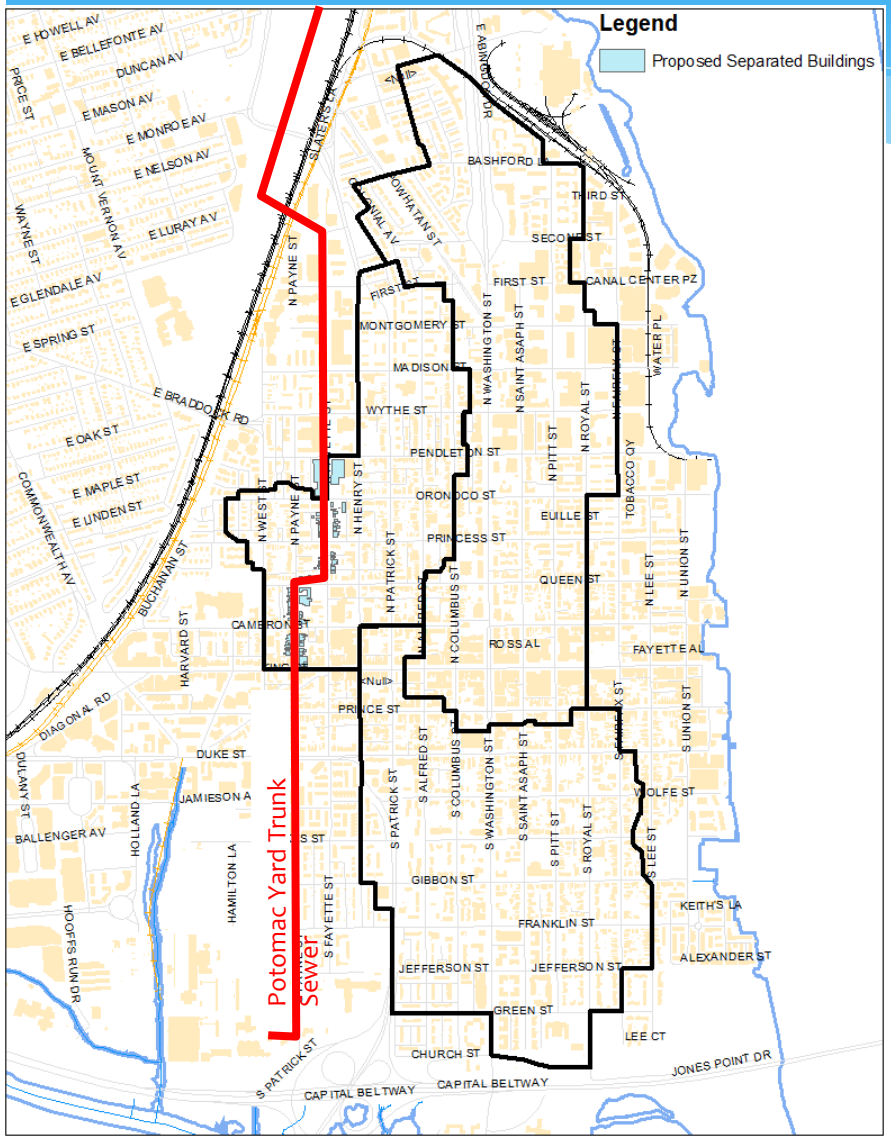
Alternative 5 Separation

Sewer Separation

- CSS Area ≈ 314 acres
- Assuming a 17-year schedule
- 19 acres under construction continuously for 17 years
- Assumes Year 1 starts in 2018
- Construction ends at the end of 2035



Payne & Fayette Project Description



- Sanitary sewers to be disconnected from the combined system and reconnected to the Potomac Yard Trunk Sewer
- Work to be confined generally to the following intersections :
  - N Fayette & Oronoco Sts
  - N Fayette & Princess Sts
  - N Fayette & Queen Sts
  - N Payne & Queen Sts
  - N Payne & Cameron Sts
- Separation of sanitary sewers will improve water quality
- Construction in 2015
  - Area: ~3.6 acres
  - Cost ~$1M

Alternative 6
Green Infrastructure

Types of Green Infrastructure

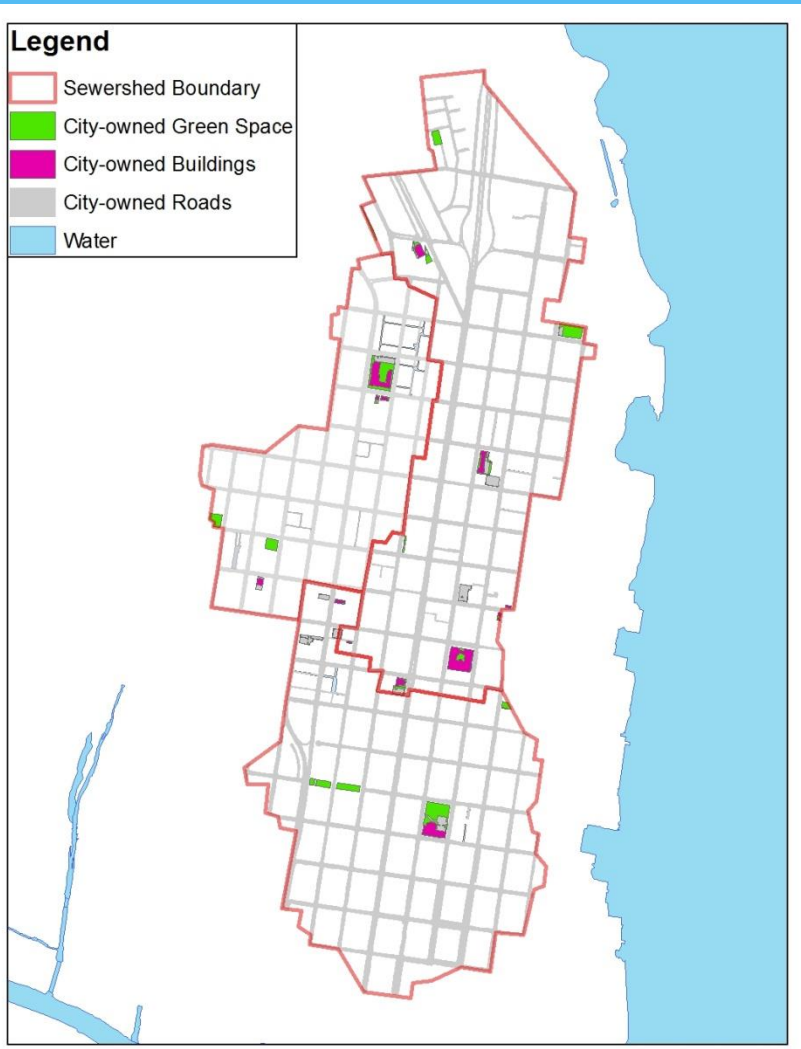
* Under Consideration
  - Permeable Pavement
    - Alleys
    - Parking Lanes
    - Sidewalks
  - Planter Boxes
  - Bioswales
  - Downspout Disconnect

Right-of-way Bioretention

Green Alley

Green Space in the CSS

* Limited opportunities for implementation of GI
  - Highly urban environment
  - Target City properties and right-of-way
  - 20+ year implementation
* Site specific conditions will dictate
  - Utilities
  - Soil conditions
* Other Green Programs
  - Washington, DC
  - Philadelphia
  - New York City



Preliminary GI Reduction

- Feasible GI Implementation
  - Target 60% of City-owned property area
  - Target 10% of City Right-of-Way area
  - 164,000 gallon capture per 1” storm
- 100% GI Implementation
  - What If Analysis
  - Target 100% of City-owned parcel area
  - Target 100% of City Right-of-Way area
  - 1,693,000 gallon capture per 1” storm

Year	Overflow Volume (MG)	Feasible GI Implementation		100% GI Implementation	
		(MG)	(%)	(MG)	(%)
1984	61	5	9%	39	63%
2004-2005	219	10	5%	104	48%

*These are preliminary estimates and are subject to change.

Evaluation Criteria

* City's Evaluation Criteria
  - Cost
  - CSO Reduction (Volume)
  - Effectiveness
  - Disruption to the Community
  - Implementation Effort
  - Public Acceptance
  - Expandability
  - Net Environmental Benefit
  - Potential Nutrient Credits for Chesapeake Bay TMDL
  - Permitting Issues
  - Required Maintenance

* Assign Weighting
* Rank Alternatives based on Criteria

* Others…

Next Steps

* Phase 1 Public Meeting (February 2015)
* Complete the Alternatives Analysis Technical Memoranda (March 2015)
* Complete the Water Quality Modeling (March 2015)
* Phase 2 Public Meeting (May-June 2015)
* Additional Feasibility Investigations (Summer 2015 – 2016)
* Implementation Plan (2016)
* Phase 3 Public Meeting (May-June 2016)
* Long Control Plan Update (August 2016)

EXTRA SLIDES

Potential GI for City-owned Parcels

Land Use	GI	Total CSS Area	Target Served Area		Target Installed Area		Estimated Controlled Stormwater Volume for 1” Storm	Estimated Volume Reduction per 1" Storm	Implementation Timeline
		(acres)	(acres)	(%)	(acres)	(%)	(% reduction)	(gallons)	
Buildings	Downspout disconnect	1.6	0.81	50%	0.81	50%	15%	3,288	20 yrs
Impervious Cover	Permeable pavement	1.4	0.69	50%	0.17	13%	60%	11,193	20 yrs
	Bioswale or rain garden		0.27	20%	0.01	1.0%	40%	2,985	10 yrs
Total		**3.0**	**1.77**	**59%**	**0.99**			**17,466***	

* Estimate increases to 28,000 gallons if 100% of target areas is addressed.

Potential GI for City Right-of-Way

Land Use	GI	Total CSS Area	Target Served Area		Target Installed Area		Estimated Controlled Stormwater Volume for 1” Storm	Estimated Volume Reduction per 1" Storm	Implementation Timeline
		(acres)	(acres)	(%)	(acres)	(%)	(% reduction)	(gallons)	
Roads	Permeable pavement in parking lanes	70.7	7.07	10%	1.77	3%	60%	115,142	40 yrs
Alleys	Permeable pavement	2.0	0.51	25%	0.13	6%	60%	8,247	20 yrs
Sidewalks	Permeable pavement	29.5	1.48	5%	0.37	1%	60%	24,073	40 yrs
Total		**102.2**	**9.05**	**9%**	**2.26**			**147,462***	

* Estimate increases to 1.7 MG if 100% of target areas is addressed.

Potential GI Summary

	Reasonable Estimate	100% Implementation
City-owned Parcels	17,000 gallons	27,000 gallons
City Right-of-Way	147,000 gallons	1,666,000 gallons
Total	**288,000 gallons**	**1,693,000 gallons**